CLAIMS

1. A method for producing a mesostructred film film comprising the steps of:

preparing a reaction solution containing a precursor material for mesostructred film which contains a metal oxide, and an amphiphilic material;

applying the reaction solution onto a substrate having a capability of orienting an aggregate of the amphiphilic material in a predetermined direction; and

forming the mesostructred film having a plurality of the aggregates of the amphiphilic material oriented in the predetermined direction while holding the substrate onto which the reaction solution has been applied in a vapor-containing atmosphere.

2. A method for producing a mesostructred film according to claim 1, wherein the precursor material contains tin.

3. A method for producing a mesostructred film according to claim 1, wherein the precursor material is a metal chloride.

4. A method for producing a mesostructred film according to claim 1, wherein the amphiphilic

material is a surfactant.

5. A method for producing a mesostructred film according to claim 1, wherein the step of forming the mesostructred film having a plurality of aggregates of the amphiphilic material oriented in the predetermined direction is performed at a temperature of 100°C or less.

6. A method for producing a mesostructred film according to claim 1, wherein the step of forming the mesostructred film having a plurality of aggregates of the amphiphilic material oriented in the predetermined direction is performed at a relative humidity in a range of from 40% to 100%.

7. A porous film on a substrate, comprising a plurality of tube-shaped pores oriented in a predetermined direction and containing a metal oxide in a pore wall of the porous film.

8. A porous film according to claim 7, the porous film comprising tin oxide in the pore wall.

9. A porous film according to claim 7, wherein the tube-shaped pores are mesopores each having a pore diameter of from 2 nm to 50 nm.

10. A porous film according to claim 7, wherein the pores hold an aggregate of an amphiphilic material.

11. A porous film according to claim 7, wherein at least 60% of the tube-shaped pores are oriented within a range of -40° to +40° in an orientation direction distribution as measured by an in-plane X-ray diffraction analysis.

12. A porous film according to claim 7, wherein the substrate has a capability of orienting the aggregate of the amphiphilic material in the predetermined direction.

13. A porous film according to claim 12, wherein the substrate having the capability of orienting the aggregate of the amphiphilic material in the predetermined direction is a substrate on the surface of which a polymer compound film provided with anisotropy has been formed.

14. A porous film according to claim 12, wherein the substrate having the capability of orienting the aggregate of the amphiphilic material in the predetermined direction is a monocrystal substrate having such an orientation that an atomic

arrangement at a surface of the substrate has two-fold symmetry.

15. A porous film according to claim 14, wherein the monocrystal substrate is of the (110) surface of silicon monocrystal.

16. A porous film according to claim 12, wherein the substrate having the capability of orienting the aggregate of the amphiphilic material in the predetermined direction is a substrate on the surface of which a polymer compound film provided with anisotropy or a Langmuir-Blodgett film of a polymer compound has been formed.

17. A method for producing a porous film comprising the steps of:

preparing a reaction solution containing a precursor material for a porous material which contains a metal oxide, and an amphiphilic material;

applying the reaction solution onto a substrate having a capability of orienting an aggregate of the amphiphilic material in a predetermined direction;

forming the porous material having a plurality of the aggregates of the amphiphilic material oriented in the predetermined direction while holding the substrate onto which the reaction solution has

been applied in a vapor-containing atmosphere; and

removing the amphiphilic material to form a pore.